George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

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ORGANIZATIONAL INSTRUCTION

Professional Development Roadmap (PDRM) for Software Assurance Engineers

OPR(s)	**OPR DESIGNEE**
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DOCUMENT HISTORY LOG

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Baseline	Baseline	12/6/04	New document.

Professional Development Roadmap for S&MA Software Assurance Engineers

1. PURPOSE, SCOPE, APPLICABILITY

1.1. Purpose – The purpose of this Organizational Instruction (OI) is to establish a voluntary training and development roadmap for Software Assurance Engineers within the Marshall Space Flight Center (MSFC) Safety and Mission Assurance (S&MA) Office. This OI identifies the minimum level of training, knowledge and skills that MSFC S&MA Software Assurance Engineers should acquire in developing their engineering discipline expertise.

1.2. Scope – This OI is meant to serve as a development roadmap for Software Assurance Engineers who support MSFC programs and projects. It provides a comprehensive list of training, knowledge requirements and on-the-job (OJT) experience needed by MSFC S&MA Software Assurance Engineers to effectively execute their duties.

This roadmap establishes three qualification levels (Novice, Journeyman and Expert), and provides a process for progressive qualification at each level.

This roadmap will be used in conjunction with Individual Development Plans (IDP) to encourage Software Assurance Engineering specialists to pursue development activities most appropriate to their specialty. The intent is to use the roadmap to guide the development of IDPs for S&MA Software Assurance Engineers.

1.3. Applicability – This OI applies to all MSFC S&MA personnel who seek to provide MSFC S&MA Software Assurance Engineering services, both in-house and off site, and who choose to participate. Mission support contractor personnel are also encouraged to participate in this voluntary program (or in a tailored mission support contractor program approved by the S&MA Director).

Personnel must satisfy the prerequisites specified in this OI before participating in this roadmap process.

2. DOCUMENTS

2.1. Applicable Documents

2.1.1 MPG 3410.1 Training
2.1.2 MWI 3410.1 Personnel Certification Program
2.1.3 Individual Development Plan Instruction (Being revised)

2.2 Reference Documents

2.2.1 Organizational Instruction: Professional Development Roadmap (PDRM) for System

Safety Engineers, Safety and Mission Assurance, Marshall Space Flight Center.

2.2.2 Organizational Instruction: Professional Development Roadmap (PDRM) for Reliability and Maintainability Engineers, Safety and Mission Assurance, Marshall Space Flight Center.

2.2.3 Organizational Instruction: Professional Development Roadmap (PDRM) for Quality Engineers, Safety and Mission Assurance, Marshall Space Flight Center.

3. DEFINITIONS AND ACCRONYMS

3.1 The Professional Development Roadmap (PDRM) identifies and documents the minimum training, knowledge requirements and on-the-job (OJT) experience needed by MSFC S&MA personnel at three levels of their discipline expertise development.

3.2 Individual Development Plan (IDP) – is a document developed jointly by the employee and supervisor to plan the employee's training and development needs as well as to identify possible training solutions. The plan will focus on immediate and short-term goals that are in line with the longer-term goals of both the employee and the organization. The IDP focuses on enhancing the competencies the employee needs to improve the Center's, and ultimately, the Agency's effectiveness.

3.3 Qualification – the act of verifying and documenting that personnel have completed required training, medical requirements as required, and have demonstrated specified proficiency.

3.4 Qualification levels – are defined as:

- Novice: The lowest recognizable level (Appendix A).
- Journeyman: Intermediate level of expertise (Appendix B).
- Expert: The highest level of expertise (Appendix C).

3.5 Qualification Criteria – are specified in Appendix A (Novice), Appendix B (Journeyman) and Appendix C (Expert) and include three categories of accomplishments that demonstrate discipline expertise:

- Training – traditional, online and computer based.
- Reference documents – demonstrating understanding.
- On the Job training (OJT) – demonstrating specific skills.

3.6 Prerequisites – that must be satisfied prior to becoming an Apprentice and participating in the PDRM process are specified in Appendix A.

3.7 Application for Qualification: - must be submitted by the candidate seeking qualification at the completion of the requirements at each level. Application consists of:

- Completed and approved application Form (Appendix D).
- Completed and approved copy of Appendix A, (for Novice qualification), Appendix B (for Journeyman qualification) or Appendix C (for Expert qualification).

3.8 Implementation requirements – are specific actions required to initially implement this OI. (See section 4.1).

3.9 Qualification of Experienced Personnel – may be earned by documenting candidate's previously completed training and development. (See section 4.3).

3.10 Qualification by Designation (Grandfathering) – is qualification prior to completion of the required PDRM line items. This will be done only during initial process implementation stages to create discipline Champion and Mentors. Personnel certified in this manner are expected to document their qualifications as soon as possible thereafter. (See section 4.4).

3.11 Equivalent Training Criteria – are classes or experiences that may be substituted for those specified in the Appendices. During initial stages of the program, or when new employees are transferred into S&MA, previously completed items may be substituted with approval of the Champion. Thereafter, the Champion must approve all equivalent criteria in advance.

3.12 Personnel and Roles – required to implement this OI are defined below:

3.12.1 Candidate – is an employee or mission support contractor who seeks qualification via the PDRM process.

3.12.2 Supervisor – the organizational line manager who provides supervisory functions and responsibilities for employee positions requiring training and/or qualification. The supervisor helps create, and approves, the candidate's IDP, verifies completion of the OJT requirements, and recommends the candidate for qualification.

3.12.3 Mentor – is an experienced Software Assurance Engineer who is selected as, and who agrees to perform as, a coach to the candidate in the PDRM qualification process. Mentors are also responsible for verifying candidate's understanding of the required reference documents.

Mentors are normally required to be certified at least at the Journeyman Level (Expert level if mentoring a candidate for Expert qualification).

A Software Assurance Engineer who does not meet the qualification requirement, but who has extensive and relevant experience, may be approved to serve as Mentor on a case-by-case basis. This exception requires approval by the candidate's supervisor and the discipline Champion.

3.12.4 Software Assurance Engineering Champion – is an individual recognized as a key leader in the S&MA Software Assurance Engineering discipline, and is designated by the S&MA

Director (or his/her designee). The Champion is responsible for technical content of this PDRM, approval of any "equivalent" criteria, selecting and training Mentors, and participation in the Qualification Review Board.

3.12.5 Qualification Review Board – is responsible for reviewing and approving qualification applications. The Board will consist of the S&MA Director (or his/her designee), the discipline Champion, and others selected by the S&MA Director. The Board will also review and approve any changes to this OI.

3.13 PDRM Designation Memorandum – a document signed by the Director of S&MA that identifies S&MA personnel who are authorized to serve as discipline Champion, Mentors and Qualification Review Board members.

4. INSTRUCTIONS

4.1 Implementation Requirements – Implementation of this OI will begin upon approval by the S&MA Director, and will require the following additional actions:

- Selecting the Software Assurance Engineering discipline Champion, and designating (grandfathering) him/her to be certified at the Expert level.

- Selecting Software Assurance Engineering discipline Mentors, and designating (grandfathering) them to be certified at the Journeyman or Expert level.

- Appointing Qualification Review Board Members.

- Publishing the PDRM Designation Memorandum.

- Authorizing and initiating a work task for the Champion and/or Mentors to prepare a set of checklists and sample questions to be used as guidelines for demonstrating candidate knowledge of the reference documents.

- Formalizing and baselining the in-house courses identified in the appendices that are currently taught informally by NASA employees and mission support contractors

- Communicating to all personnel of the existence, purpose, expectations, process and names of key personnel associated with this OI.

4.2 Qualification Process (Normal) - A candidate seeking qualification will use the following process. This process is further illustrated in the flow chart in Section 11.

4.2.1 Candidate declares S&MA specialty as Software Assurance Engineer. Supervisor approves.

4.2.2 Candidate documents completion of prerequisites using a completed copy of the application form (Appendix D). The candidate becomes an Apprentice.

4.2.3 Supervisor seeks/assigns Mentor (with support from the discipline Champion).

4.2.4 Apprentice works with Supervisor to develop an IDP containing appropriate items from the PDRM (Appendix A).

4.2.5 Apprentice pursues the required developmental activities per the PDRM and IDP.

4.2.6 Upon completion of each developmental activity, the Apprentice obtains the proper signature on the PDRM (Appendix A) as shown in the following table:

Criteria Type	**Required Activity**	**Verifying Signature**
Training Classes	Complete successfully	Training Department
Reference Documents	Demonstrate understanding	Mentor
OJT Experiences	Complete successfully	Supervisor

4.2.7 Upon completion and documentation of all required activities for qualification, Apprentice completes the application form, obtains signature from the discipline Champion and submits completed package to his/her Supervisor.

4.2.8 Supervisor signs the application and forwards it to the S&MA Director for action by the Qualification Review Board.

4.2.9 The Qualification Review Board reviews the application, and makes the approval decision.

4.2.10 A Novice may earn Journeyman qualification by continuing the above process using Appendix B.

4.2.11 A Journeyman may earn Expert qualification by continuing the above process using Appendix C.

4.3 Qualification of Experienced Personnel - Existing S&MA personnel and new personnel hired/transferred into S&MA, who are experienced in the Software Assurance Engineering discipline, may seek qualification at any level for which they qualify by documenting their previously completed achievements and using the following process. This process is further illustrated in the flow chart in Section 11.

4.3.1 Candidate documents previously completed training classes and OJT achievements on the appropriate appendices (e.g. a candidate applying for Expert qualification must complete

Appendix A, B and C):

- Equivalent training and experiences may be substituted for the criteria specified in the appendices with the approval of the discipline Champion.

- The training department will verify training classes. Candidates are responsible for providing proof (e.g. copies of certificates, grade reports and/or transcripts) of non-NASA training to the training department.

- OJT will be verified by signature of the Supervisor.

4.3.2 Candidate must demonstrate his/her understanding of the reference documents using the normal qualification process (See section 4.2).

4.3.3. Upon completion and documentation of all required activities for qualification, candidate completes the application form (Appendix D), obtains discipline Champion approval and submits the package to his/her Supervisor for approval.

4.3.4 Supervisor approves the application and forwards it to the Qualification Review Board for action.

4.3.5. The Qualification Review Board reviews the application and decides the qualification level to be granted.

4.4 Qualification by Designation (Grandfathering) – During the initial PDRM process implementation, the S&MA Director (or his/her designee) may certify the discipline Champion and Mentors prior to their completion of the PDRM application. Any personnel so certified are expected to document their qualifications per the PDRM process for experienced personnel (section 4.3) as soon as possible thereafter.

4.5 Maintaining Qualification - It is expected that personnel certified at the Expert level will (1) continue training (at least 40 hours per year in their discipline) and (2) continue to perform OJT activity at the level described in Appendix C.

4.6 Process Measurement - will be accomplished by baselining the number of personnel certified at each level, and thereafter measuring the progress toward qualification by S&MA personnel. The baseline will be created 6 months after implementation. Measurements will be made semi-annually thereafter. Each semi-annual measurement will count the number of individuals certified at each level, and estimate the progress (percent complete) of each participating individual toward the next level. Department Mangers will report this measurement at the next scheduled monthly status review.

4.7 Amendments – Changes to this Organizational Instruction are made per the documented

Organizational Instruction Change Process. The Qualification Review Board will review proposed changes to this PDRM prior to submitting them to the MSFC Director of S&MA for approval. The custodial responsibility for this PDRM shall be assigned to the Safety, Reliability, and Quality Assurance Policy and Assessment Department (QD40).

5. NOTES

5.1. OI Replacement - None

6. SAFETY PRECAUTIONS AND WARNING NOTES

None

7. APPENDICES, DATA, REPORTS, AND FORMS

A – PDRM for Software Assurance Engineer: Novice
B – PDRM for Software Assurance Engineer: Journeyman
C – PDRM for Software Assurance Engineer: Expert
D – Qualification Application Form

8. RECORDS

Record	Repository	Period of Time
Completed PDRM (Official Course completion information will be kept by the MSFC Training Office)	S&MA Training Officer	5 years (Documentation of the appropriate PDRM will be kept by the MSFC Training Office.)

9. TOOLS, EQUIPMENT, AND MATERIALS

None

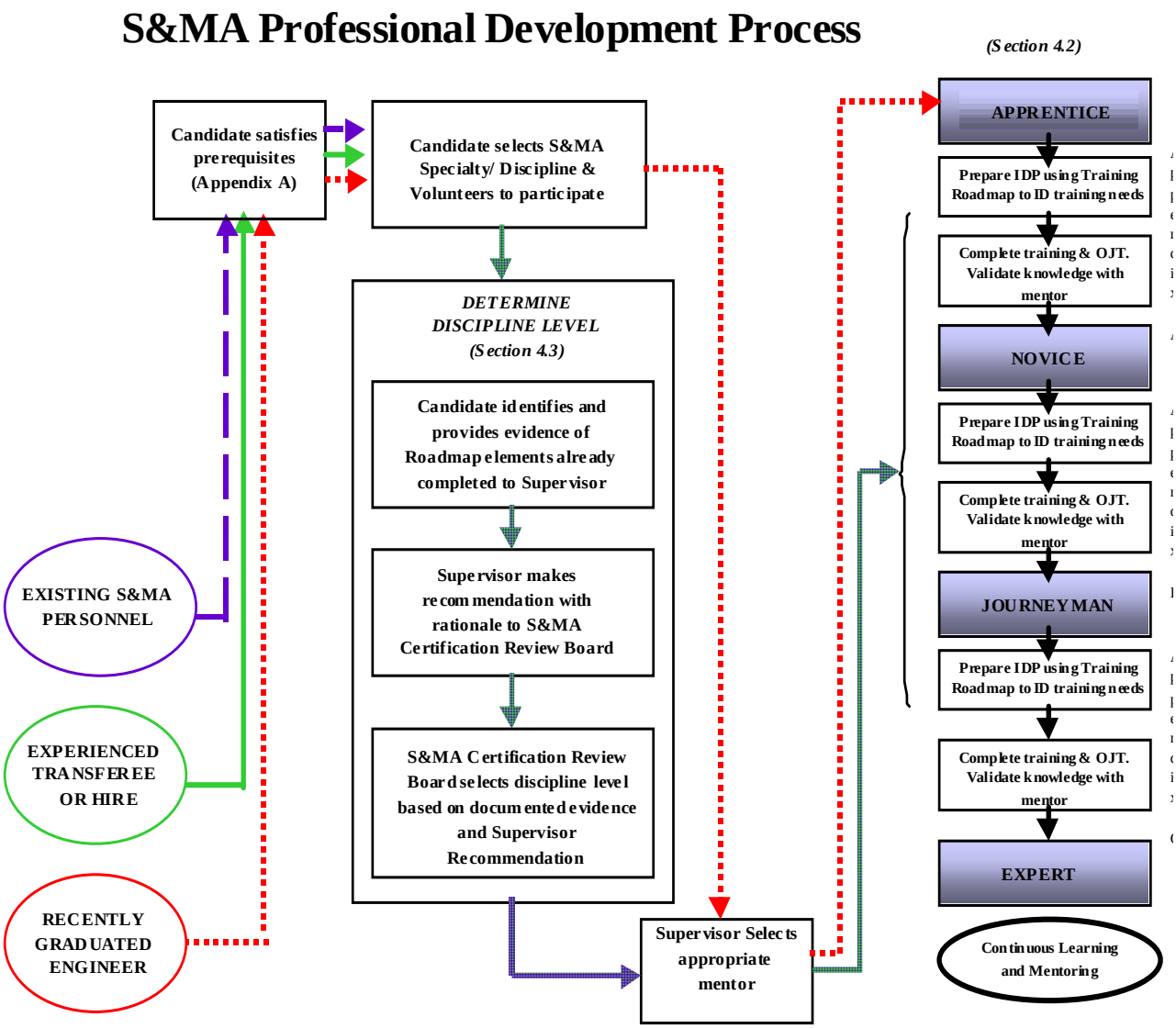
10. PERSONNEL TRAINING REQUIREMENTS

See Appendix A - C

11. FLOW DIAGRAM

The flow diagram (Figure 11-1) illustrates the PDRM qualification process described in this OI.

Figure 11-1


S&MA Professional Development Process
(Section 4.2)
Candidate satisfies prerequisites (Appendix A)
Candidate selects S&MA Specialty/ Discipline & Volunteers to participate
DETERMINE DISCIPLINE LEVEL
(Section 4.3)
Candidate identifies and provides evidence of Roadmap elements already completed to Supervisor
Supervisor makes recommendation with rationale to S&MA Certification Review Board
S&MA Certification Review Board selects discipline level based on documented evidence and Supervisor Recommendation
EXISTING S&MA PERSONNEL
EXPERIENCED TRANSFEREE OR HIRE
RECENTLY GRADUATED ENGINEER
Supervisor Selects appropriate mentor
APPRENTICE
Prepare IDP using Training Roadmap to ID training needs
Complete training & OJT. Validate knowledge with mentor
NOVICE
Prepare IDP using Training Roadmap to ID training needs
Complete training & OJT. Validate knowledge with mentor
JOURNEYMAN
Prepare IDP using Training Roadmap to ID training needs
Complete training & OJT. Validate knowledge with mentor
EXPERT
Continuous Learning and Mentoring

Notes:

1. Qualification Review Board is the decision authority for qualification levels and approvals.

APPENDIX A: PDRM for Software Assurance Engineers:
NOVICE Qualification Requirements

A.1 Objective:

This Appendix provides the qualification criteria for Software Assurance Engineers to be certified at the Novice level, using the process described in the body of the Organization Instruction.

A.2 Prerequisites:

Prior to beginning the process, the candidate must qualify as an Apprentice Software Assurance Engineer by satisfying the following prerequisites:

1. Candidate must volunteer to participate in the PDRM qualification program, declare his/her specialty as Software Assurance Engineer, and obtain approval of his/her immediate supervisor.

2. Candidate must complete the S&MA Overview Orientation Class, (4 hour internal class).

3. Candidate must complete a program specific overview orientation class for the candidate's assigned program, including the S&MA aspects of that program, if provided.

4. Candidate must be skilled in the use of the MS Office Suite including Word, Excel and PowerPoint, and must show evidence of capability to make an effective presentation.

A.3 Experience:

These engineers are at the beginning stages of their careers and work primarily on small portions of larger projects. Prior to being certified as a Novice Software Assurance Engineer, candidate must have at least 1 to 3 years of experience in fields such as quality control, information technology, software engineering, computer science, and test that provided:

1. Familiarity with software assurance or related work,

2. Pertinent product or process knowledge and skill,

3. Ability to interpret and apply contract requirements and engineering specifications,

4. Skill in dealing with others in person to person work relationships,

APPENDIX A: PDRM for Software Assurance Engineers:
NOVICE Qualification Requirements

TRAINING CLASS REQUIREMENTS **Equivalent classes may be substituted with approved by the discipline Champion. Sequence is suggested but not mandatory.**		**SIGNATURE/ DATE COMPLETE**
ISO 9000 Introduction (Solar: SMA-023-01)		_____ _____ Signature Date
Software Assurance (Solar: SMA-061-01)		_____ _____ Signature Date
Flight Software (Solar: EDT-012-03)		_____ _____ Signature Date
Contract Terms and Conditions (Solar: SMA-006-01)		_____ _____ Signature Date
Audits and Reviews (SMA-004-01)		_____ _____ Signature Date
Preventive Action/Corrective Action (SMA-046-01)		_____ _____ Signature Date
Configuration Management (SMA-005-01)		_____ _____ Signature Date
As-Designed vs. As-Built (SMA-003-01)		_____ _____ Signature Date
System Safety (SMA-066-01)		_____ _____ Signature Date
System Safety Fundamentals: NSTC 002		_____ _____ Signature Date
Systems Requirements: NET Class		_____ _____ Signature Date
Reliability and Maintainability Overview (SMA-051-01)		_____ _____ Signature Date
Risk Management Overview (SMA-055-01)		_____ _____ Signature Date

APPENDIX A: PDRM for Software Assurance Engineers:
NOVICE Qualification Requirements

Data Management (SMA-012-01)		_____ _____ Signature Date
FMEA/CIL: (SMA-017-01)		_____ _____ Signature Date
NASA Safety Reporting System: (038-01)		_____ _____ Signature Date
S&MA Documentation: Solar (SMA-058-01)		_____ _____ Signature Date
Microsoft Project-Introduction: MSFC Professional Development Class (2.5 days) OR MSFC video class, Building 4200 (Number TBD): OPTIONAL		_____ _____ Signature Date
Influencing Others: MSFC Organizational Development Class (1 day)		_____ _____ Signature Date
Conflict Management: MSFC Professional Development Class (2 days)		_____ _____ Signature Date
		_____ _____ Signature Date
		_____ _____ Signature Date
		_____ _____ Signature Date

Notes:
1. Classes identified as in-house classes are MSFC classes that must be registered with the Training Department.

APPENDIX A: PDRM for Software Assurance Engineers:
NOVICE Qualification Requirements

REFERENCE MATERIALS **Demonstrate familiarity with key concepts as defined by the discipline champion**		**SIGNATURE/ DATE COMPLETE**
NASA-STD-8739.8 "Software Assurance Standard"		_____ _____ Signature date
NPR 7150 "Software Engineering"		_____ _____ Signature date
QD-QE-007 "Software Quality Assurance Planning"		_____ _____ Signature date
QD-QE-008 "Software Assurance Status Report		_____ _____ Signature date
QD-QE-009 "Software Quality Assurance Review/Approval of Technical Documents"		_____ _____ Signature date
QD-QE-010 "Software Quality Assurance Software Milestone Review Support"		_____ _____ Signature date
QD-QE-011 "Software Quality Assurance Software Audits"		_____ _____ Signature date
QD-QE-012 "Software Quality Assurance Support of Formal Software Testing"		_____ _____ Signature date
QD-QE-013 "Software Quality Assurance Software Acceptance and Delivery Support"		_____ _____ Signature date

Notes:
1. Process Champion is responsible for identifying specific level of understanding required (See section 4.1).

2. Cancelled standards are included due to their educational value.

APPENDIX A: PDRM for Software Assurance Engineers:
NOVICE Qualification Requirements

ON THE JOB TRAINING **Complete the following activities**		SUPERVISOR SIGNATURE/ DATE COMPLETE
Under appropriate supervision, observe/support conduct a requirements review in support of a NASA/MSFC project or program.		_____ _____ Signature date
Under appropriate supervision, observe/support the review of contract statement of work (Software Assurance/Software Development Sections) in support of a NASA/MSFC project or program.		_____ _____ Signature date
Under appropriate supervision, observe/support the planning and conduct of two software assurance audits in support of a NASA/MSFC project or program.		_____ _____ Signature date
Under appropriate supervision, observe/support formal software verification in support of a NASA/MSFC project or program.		_____ _____ Signature date
Under appropriate supervision, observe/support a software peer review in support of a NASA/MSFC project or program.		_____ _____ Signature date
Under appropriate supervision, observe/support a software configuration review board in support of a NASA/MSFC project or program.		_____ _____ Signature date
Under appropriate supervision, observe/support at least one design review in support of a NASA project or program.		_____ _____ Signature date
Join and participate in relevant professional society (e.g. Software Quality Engineering) by attending meetings and participating in discussions and activities.		_____ _____ Signature date

Notes:
1. Candidate should work with his/her Supervisor to identify specific applicable assignments. Discipline Champion may be consulted to ensure proposed assignment will satisfy the qualification requirements.

APPENDIX B: PDRM for Software Assurance Engineers:
JOURNEYMAN Qualification Requirements

B.1 Objective:

This Appendix provides the qualification criteria for Software Assurance Engineers to be certified at the Journeyman level, using the process described in the body of the Organization Instruction.

B.2 Prerequisites:

Prior to beginning the process, the candidate must be certified as a Novice Software Assurance Engineer per the requirements in Appendix A.

B.3 Years of Experience:

Prior to qualification as a Journeyman Software Assurance Engineer, candidate should have 3 to 5 years of relevant experience in the discipline that demonstrates:

1. Practical knowledge in monitoring, controlling, or maintaining the quality for products or services in software assurance or related areas,

2. Direct experience in hardware, or software with a solid base of technical expertise.

3. Working independently and managing definite discipline of projects.

APPENDIX B: PDRM for Software Assurance Engineers:
JOURNEYMAN Qualification Requirements

TRAINING CLASS REQUIREMENTS **Equivalent classes may be substituted with approved by the discipline Champion.** **Sequence is suggested but not mandatory**		**SIGNATURE/ DATE COMPLETE**
Cost of Quality (SMA-010-01)		_____ _____ Signature date
Insight vs. Oversight (SMA-025-01)		_____ _____ Signature date
Mission Assurance Planning (SMA-037-01)		_____ _____ Signature date
S&MA Documentation (SMA-058-01)		_____ _____ Signature date
Stamp Control (SMA-064-01)		_____ _____ Signature date
Writing Testable Requirements (SQE)		_____ _____ Signature date
Technical Reviews and Inspections (SQE)		_____ _____ Signature date
Software System Safety (SMA-062-01)		_____ _____ Signature date
Software System Safety (NSTC 025)		_____ _____ Signature date
Test Management (SQE)		_____ _____ Signature date
Systematic Software Testing (SQE)		_____ _____ Signature date
Requirements Based Testing (SQE)		_____ _____ Signature date
Leading from the Inside Out: MSFC Professional Development Class (2 days)		_____ _____ Signature date
Communicating For Results: MSFC Professional Development Class (2 days).		_____ _____ Signature date

APPENDIX B: PDRM for Software Assurance Engineers:
JOURNEYMAN Qualification Requirements

Team Development in the Workplace: MSFC Organizational Development Class (3 days)		_____ _____ Signature date
Mentoring: MSFC Organizational Development Class (1 day). Suggested at end of qualification for Journeyman		_____ _____ Signature date

Notes:

1. Classes identified as in-house are MSFC classes that must be registered with the Training Department.

APPENDIX B: PDRM for Software Assurance Engineers:
JOURNEYMAN Qualification Requirements

REFERENCE MATERIALS **Demonstrate working knowledge with contents as defined by the discipline champion**		**MENTOR SIGNATURE/ DATE COMPLETE**
IEEE/EIA-12207.0 "IEEE/EIA Standard: Industry Implementation of International Stand ISO/IEC 12207:1995 Standard for Information Technology – Software Life Cycle Processes.		_____ _____ Signature date
IEEE/EIA-12207.1 "IEEE/EIA Standard: Industry Implementation of International Stand ISO/IEC 12207:1995 Standard for Information Technology – Software Life Cycle Processes – Life Cycle Data		_____ _____ Signature date
IEEE/EIA-12207.2 "IEEE/EIA Standard: Industry Implementation of International Stand ISO/IEC 12207:1995 Standard for Information Technology – Software Life Cycle Processes – Implementation Considerations		_____ _____ Signature date
IEEE-1008 "IEEE Standard for Software Reviews"		_____ _____ Signature date
IEEE-1044 "IEEE Standard Classification for Software Anomalies"		_____ _____ Signature date
IEEE-1058 "IEEE Standard for Software Project Management Plans"		_____ _____ Signature date
IEEE-1228 "IEEE Standard for Software Safety Plans"		_____ _____ Signature date
IEEE-1610.12 "IEEE Standard Glossary of Software Engineering Terminology"		_____ _____ Signature date
IEEE-STD-1012 "IEEE Standard for Software Verification and Validation"		_____ _____ Signature date
IEEE-STD-730 "IEEE Standard for Software Quality Assurance Plans"		_____ _____ Signature date

APPENDIX B: PDRM for Software Assurance Engineers:
JOURNEYMAN Qualification Requirements

IEEE-STD-828 "IEEE Standard for Software Configuration Management Plans"		_____ _____ Signature date
IEEE-STD-829 "IEEE Standard for Software Test Documentation"		_____ _____ Signature date
IEEE-STD-830 "IEEE Standard for Software Requirements Specifications"		_____ _____ Signature date

Notes:
1. Process Champion is responsible for identifying specific level of understanding required (See section 4.1).

APPENDIX B: PDRM for Software Assurance Engineers:
JOURNEYMAN Qualification Requirements

ON THE JOB TRAINING **Complete the following activities in any sequence**		**SUPERVISOR SIGNATURE/ DATE COMPLETE**
Conduct (or participate on a team conducting) requirements review in support of a NASA project or program.		_____ _____ Signature date
Review (or participate on a team reviewing) a contract statement of work (software assurance and software development sections) in support of a NASA project or program.		_____ _____ Signature date
Perform (or participate on a team performing) an internal audit in support of a NASA project or program.		_____ _____ Signature date
Perform (or participate on a team performing) each type of a software milestone review in support of a NASA project or program.		_____ _____ Signature date
Perform (or participate on a team performing) a peer review in support of a NASA project or program.		_____ _____ Signature date
Support formal software verification in support of a NASA/MSFC project or program.		_____ _____ Signature date
Support completion of a system software safety checklist in support of a NASA/MSFC project or program.		_____ _____ Signature date
Participate in a Software Review Board in support of a NASA project or program		_____ _____ Signature date
Contribute to relevant professional society (e.g.: Society of Reliability Engineers) activity via discussions, committee/sub-committee work or writing/presenting a paper.		_____ _____ Signature date
Participate in inter-program or inter-center coordinating activity to enhance MSDC and/or NASA expertise in your discipline		_____ _____ Signature date

APPENDIX B: PDRM for Software Assurance Engineers: JOURNEYMAN Qualification Requirements

Work toward professional qualification		_____ _____ Signature date
Mentor other personnel in your discipline to help them improve their skills/expertise. This can be as a mentor to others in this PDRM process or as an informal coach in your daily work.		_____ _____ Signature date

Notes:

1. Candidate should work with his/her Supervisor to identify specific applicable assignments. Discipline Champion may be consulted to ensure proposed assignment will satisfy the qualification requirements.

APPENDIX C: PDRM for Software Assurance Engineers:
EXPERT Qualification Requirements

C.1 Objective:

This Appendix provides the qualification criteria for Software Assurance Engineers to be certified at the Expert level, using the process described in the body of the Organization Instruction.

C.2 Prerequisites:

Prior to beginning the process, the candidate must be certified as a Journeyman Software Assurance Engineer per the requirements of Appendix B.

C.3 Years of Experience:

Prior to being certified as an Expert Software Assurance Engineer, The candidate must have at least 8 to 10 years experience in the Software Assurance profession with:

1. Unique experience in NASA software projects and programs,

2. Responsibility for developing Novice and Journeyman Software Assurance Engineers, and

3. Serving as leaders or promoters of large portions of a project or an entire project.

APPENDIX C: PDRM for Software Assurance Engineers:
EXPERT Qualification Requirements

TRAINING CLASS REQUIREMENTS **Equivalent classes may be substituted with approved by the discipline Champion.** **Sequence is suggested but not mandatory**		**SIGNATURE/ DATE COMPLETE**
Crossing Department Lines: NASA HQ Class, Agency leadership and Development programs (5 days).		_____ _____ Signature date
Problem Solving and Decision Making: MSFC Organizational Development Class (3 days)		_____ _____ Signature date
7 Habits of Highly Effective People		_____ _____ Signature date
Elective: To be determined by discipline champion		_____ _____ Signature date
Elective: To be determined by discipline champion		_____ _____ Signature date
Elective: To be determined by discipline champion		_____ _____ Signature date

APPENDIX C: PDRM for Software Assurance Engineers:
EXPERT Qualification Requirements

REFERENCE MATERIALS **Demonstrate comprehensive knowledge of contents as defined by the discipline champion**		**MENTOR SIGNATURE/ DATE COMPLETE**
CMMI – Guidelines for Process Integration and Product Improvement		_____ _____ Signature date
Safeware – System Safety and Computers – A guide to preventing accidents and losses caused by technology – Nancy Leveson		_____ _____ Signature date

Notes:
1. Process Champion is responsible for identifying specific level of understanding required (See section 4.1).

APPENDIX C: PDRM for Software Assurance Engineers:
EXPERT Qualification Requirements

ON THE JOB TRAINING **Complete the following activities in any sequence**		**SUPERVISOR SIGNATURE/ DATE COMPLETE**
Create a Software Assurance Plan in support of a NASA project or program.		_____ _____ Signature date
Participate in a Source Evaluation Board responsible for the software assurance contract statement and subsequent proposal review.		_____ _____ Signature date
Lead a team conducting a requirements review in support of a NASA project or program.		_____ _____ Signature date
Participate in inter-program or inter-center coordinating activity to enhance MSFC and/or NASA expertise in your discipline.		_____ _____ Signature date
Become a mentor for others in Software Assurance Engineering. Guide other team members, including design team members, to understand the importance and benefits of upfront Software Assurance Engineering efforts, to influence the design and to provide high value contribution to the program.		_____ _____ Signature date
Recommended but not yet required: Obtain relevant external professional qualification.		_____ _____ Signature date
Provide leadership to professional society activities (e.g.: working groups defining standards, society committees/ subcommittees doing work to advance the discipline).		_____ _____ Signature date

Notes:
1. Candidate should work with his/her supervisor to identify specific applicable assignments. Discipline Champion may be consulted to ensure proposed assignment will satisfy the qualification requirements.

APPENDIX D: PDRM for Software Assurance Engineers:
Application for Qualification

This application is for (Check One):

___ Entry into the PDRM Qualification process as an Apprentice;
All prerequisites have been satisfied

___ NOVICE Qualification
Appendix A is Attached and approved

___ JOURNEYMAN Qualification
Appendix B is attached and approved

___ EXPERT Qualification
Appendix C is attached and approved

Name of Candidate: _____

Organization: _____

Building/Location: _____

Phone: _____ Email: _____

Signatures:

Candidate Signature: _____ Date: _____

Discipline Champion: _____ Date: _____

Supervisor Signature: _____ Date: _____

S&MA Director: _____ Date: _____
(Or designee)